



#6

## Sequence List

&lt;110&gt; Betenbaugh et al.

&lt;120&gt; Engineering Intracellular Sialylation Pathways

&lt;130&gt; PF509P2

&lt;140&gt; 09/930,440

&lt;141&gt; 2001-08-16

&lt;150&gt; 60/227,579

&lt;151&gt; 2000-08-25

&lt;150&gt; 09/516,793

&lt;151&gt; 2000-03-01

&lt;150&gt; 60/169,624

&lt;151&gt; 1999-12-08

&lt;150&gt; 60/122,582

&lt;151&gt; 1999-03-02

&lt;160&gt; 8

&lt;170&gt; PatentIn Ver. 2.1

&lt;210&gt; 1

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&lt;212&gt; DNA

&lt;213&gt; Homo sapiens

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&lt;221&gt; CDS

&lt;222&gt; (1)..(693)

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Thr Pro Met Thr Glu Asn Gly Glu Ile Asn Phe Ser Val Ile Gly Gln  
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tat gtg gat tat ctt gtg aaa gaa cag gga gtg aag aac att ttt gtg 144  
Tyr Val Asp Tyr Leu Val Lys Glu Gln Gly Val Lys Asn Ile Phe Val  
35 40 45

aat ggc aca aca gga gaa ggc ctg tcc ctg agc gtc tca gag cgt cgc 192  
Asn Gly Thr Thr Gly Glu Gly Leu Ser Leu Ser Val Ser Glu Arg Arg  
50 55 60

cag gtt gca gag gag tgg gtg aca aaa ggg aag gac aag ctg gat cag 240  
Gln Val Ala Glu Glu Trp Val Thr Lys Gly Lys Asp Lys Leu Asp Gln  
65 70 75 80

gtg ata att cac gta gga gca ctg agc ttg aag gag tca cag gaa ctg 288  
Val Ile Ile His Val Gly Ala Leu Ser Leu Lys Glu Ser Gln Glu Leu  
85 90 95

gcc caa cat gca gca gaa ata gga gct gat ggc atc gct gtc att gca 336  
Ala Gln His Ala Ala Glu Ile Gly Ala Asp Gly Ile Ala Val Ile Ala  
100 105 110

ccg ttc ttc ctc aag cca tgg acc aaa gat atc ctg att aat ttc cta 384  
Pro Phe Phe Leu Lys Pro Trp Thr Lys Asp Ile Leu Ile Asn Phe Leu  
115 120 125

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Lys Glu Val Ala Ala Ala Ala Pro Ala Leu Pro Phe Tyr Tyr Tyr His  
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Ile Pro Ala Leu Thr Gly Val Lys Ile Arg Ala Glu Glu Leu Leu Asp  
145 150 155 160

ggg att ctg gat aag atc ccc acc ttc caa ggg ctg aaa ttc agt gat 528  
Gly Ile Leu Asp Lys Ile Pro Thr Phe Gln Gly Leu Lys Phe Ser Asp  
165 170 175

aca gat ctc tta gac ttc ggg caa tgt gtt gat cag aat cgc cag caa 576  
Thr Asp Leu Leu Asp Phe Gly Gln Cys Val Asp Gln Asn Arg Gln Gln  
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cag ttt gct ttc ctt ttt ggg gtg gat gag caa ctg ttg agt gct ctg 624  
Gln Phe Ala Phe Leu Phe Gly Val Asp Glu Gln Leu Leu Ser Ala Leu  
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Val Met Gly Ala Thr Gly Ala Val Gly Ser Phe Val Ser Arg Asp Leu  
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Ser Thr Leu Leu Ser Asn  
225 230

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 Tyr Val Asp Tyr Leu Val Lys Glu Gln Gly Val Lys Asn Ile Phe Val  
           35                  40                  45  
 Asn Gly Thr Thr Gly Glu Gly Leu Ser Leu Ser Val Ser Glu Arg Arg  
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 Gln Val Ala Glu Glu Trp Val Thr Lys Gly Lys Asp Lys Leu Asp Gln  
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 Val Ile Ile His Val Gly Ala Leu Ser Leu Lys Glu Ser Gln Glu Leu  
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 Ala Gln His Ala Ala Glu Ile Gly Ala Asp Gly Ile Ala Val Ile Ala  
           100                  105                  110  
 Pro Phe Phe Leu Lys Pro Trp Thr Lys Asp Ile Leu Ile Asn Phe Leu  
           115                  120                  125  
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 Ile Pro Ala Leu Thr Gly Val Lys Ile Arg Ala Glu Glu Leu Leu Asp  
 145                  150                  155                  160  
 Gly Ile Leu Asp Lys Ile Pro Thr Phe Gln Gly Leu Lys Phe Ser Asp  
           165                  170                  175  
 Thr Asp Leu Leu Asp Phe Gly Gln Cys Val Asp Gln Asn Arg Gln Gln  
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 Gln Phe Ala Phe Leu Phe Gly Val Asp Glu Gln Leu Leu Ser Ala Leu  
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Gly Arg Pro Ser Arg Gly Arg Pro Pro Lys Leu Gln Arg Asn Ser Arg	
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ggc ggc cag ggc cga ggt gtg gag aag ccc ccg cac ctg gca gcc cta	144
Gly Gly Gln Gly Arg Gly Val Glu Lys Pro Pro His Leu Ala Ala Leu	
35 40 45	
att ctg gcc ccg gga ggc agc aaa ggc atc ccc ctg aag aac att aag	192
Ile Leu Ala Arg Gly Gly Ser Lys Gly Ile Pro Leu Lys Asn Ile Lys	
50 55 60	
cac ctg gcg ggg gtc ccg ctc att ggc tgg gtc ctg cgt gcg gcc ctg	240
His Leu Ala Gly Val Pro Leu Ile Gly Trp Val Leu Arg Ala Ala Leu	
65 70 75 80	
gat tca ggg gcc ttc cag agt gta tgg gtt tcg aca gac cat gat gaa	288
Asp Ser Gly Ala Phe Gln Ser Val Trp Val Ser Thr Asp His Asp Glu	
85 90 95	
att gag aat gtg gcc aaa caa ttt ggt gca caa gtt cat cga aga agt	336
Ile Glu Asn Val Ala Lys Gln Phe Gly Ala Gln Val His Arg Arg Ser	
100 105 110	
tct gaa gtt tca aaa gac agc tct acc tca cta gat gcc atc ata gaa	384
Ser Glu Val Ser Lys Asp Ser Ser Thr Ser Leu Asp Ala Ile Ile Glu	
115 120 125	
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Phe Leu Asn Tyr Xaa Asn Glu Xaa Asp Ile Val Gly Asn Ile Gln Ala	
130 135 140	
act tct yca tgt tta cat cct act gat ctt caa aaa gtt gca gaa atg	480
Thr Ser Xaa Cys Leu His Pro Thr Asp Leu Gln Lys Val Ala Glu Met	
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att cga gaa gaa gga tat gat tct gkt ttc tct gtt gtg aga cgc cat	528
Ile Arg Glu Glu Gly Tyr Asp Ser Xaa Phe Ser Val Val Arg Arg His	
165 170 175	
cag ttt cga tgg agt gaa att cag aaa gga gtt cgt gaa gtg acc gaa	576
Gln Phe Arg Trp Ser Glu Ile Gln Lys Gly Val Arg Glu Val Thr Glu	
180 185 190	
cct ctg aat tta aat cca gct aaa ccg cct cgt cga caa gac tgg gat	624
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195 200 205	
gga gaa tta tat gaa aat ggc tca ttt tat ttt gct aaa aga cat ttg	672

Gly 210	Glu	Leu	Tyr	Glu	Asn	Gly 215	Ser	Phe	Tyr	Phe	Ala 220	Lys	Arg	His	Leu	
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Ile	Glu	Met	Gly	Tyr	Leu	Gln	Gly	Gly	Lys	Trp	His	Thr	Thr	Lys	Cys	
225					230					235					240	
gag	ctg	gaa	cat	agt	gtg	gat	ata	gat	gtg	gat	att	gat	tgg	cct	att	768
Glu	Leu	Glu	His	Ser	Val	Asp	Ile	Asp	Val	Asp	Ile	Asp	Trp	Pro	Ile	
				245					250					255		
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Ala	Glu	Gln	Arg	Val	Leu	Arg	Tyr	Gly	Tyr	Phe	Gly	Lys	Glu	Lys	Leu	
			260					265					270			
aag	gaa	ata	aaa	ctt	ttg	gtt	tgc	aat	att	gat	gga	tgt	ctc	acc	aat	864
Lys	Glu	Ile	Lys	Leu	Leu	Val	Cys	Asn	Ile	Asp	Gly	Cys	Leu	Thr	Asn	
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Gly	His	Ile	Tyr	Val	Ser	Gly	Asp	Gln	Lys	Glu	Ile	Ile	Ser	Tyr	Asp	
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Val	Lys	Asp	Ala	Ile	Gly	Ile	Ser	Leu	Leu	Lys	Lys	Ser	Gly	Ile	Glu	
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gtg	agg	cta	atc	tca	gaa	agg	gcc	tgt	tca	aag	cag	acg	ctg	tct	tct	1008
Val	Arg	Leu	Ile	Ser	Glu	Arg	Ala	Cys	Ser	Lys	Gln	Thr	Leu	Ser	Ser	
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tta	aaa	ctg	gat	tgc	aaa	atg	gaa	gtc	agt	gta	tca	gac	aag	cta	gca	1056
Leu	Lys	Leu	Asp	Cys	Lys	Met	Glu	Val	Ser	Val	Ser	Asp	Lys	Leu	Ala	
			340					345					350			
gtt	gta	gat	gaa	tgg	aga	aaa	gaa	atg	ggc	ctg	tgc	tgg	aaa	gaa	gtg	1104
Val	Val	Asp	Glu	Trp	Arg	Lys	Glu	Met	Gly	Leu	Cys	Trp	Lys	Glu	Val	
		355					360					365				
gca	tat	ctt	gga	aat	gaa	gtg	tct	gat	gaa	gag	tgc	ttg	aag	aga	gtg	1152
Ala	Tyr	Leu	Gly	Asn	Glu	Val	Ser	Asp	Glu	Glu	Cys	Leu	Lys	Arg	Val	
	370					375					380					
ggc	cta	agt	ggc	gct	cct	gct	gat	gcc	tgt	tcc	tac	gcc	cag	aag	gct	1200
Gly	Leu	Ser	Gly	Ala	Pro	Ala	Asp	Ala	Cys	Ser	Tyr	Ala	Gln	Lys	Ala	
385					390					395					400	
gtt	gga	tac	att	tgc	aaa	tgt	aat	ggt	ggc	cgt	ggt	gcc	atc	cga	gaa	1248
Val	Gly	Tyr	Ile	Cys	Lys	Cys	Asn	Gly	Gly	Arg	Gly	Ala	Ile	Arg	Glu	
				405					410				415			
ttt	gca	gag	cac	att	tgc	cta	cta	atg	gaa	aaa	gtt	aat	aat	tca	tgc	1296
Phe	Ala	Glu	His	Ile	Cys	Leu	Leu	Met	Glu	Lys	Val	Asn	Asn	Ser	Cys	
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caa	aaa	tag														1305
Gln	Lys															

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 35 40 45  
 Ile Leu Ala Arg Gly Gly Ser Lys Gly Ile Pro Leu Lys Asn Ile Lys  
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 His Leu Ala Gly Val Pro Leu Ile Gly Trp Val Leu Arg Ala Ala Leu  
 65 70 75 80  
 Asp Ser Gly Ala Phe Gln Ser Val Trp Val Ser Thr Asp His Asp Glu  
 85 90 95  
 Ile Glu Asn Val Ala Lys Gln Phe Gly Ala Gln Val His Arg Arg Ser  
 100 105 110  
 Ser Glu Val Ser Lys Asp Ser Ser Thr Ser Leu Asp Ala Ile Ile Glu  
 115 120 125  
 Phe Leu Asn Tyr Xaa Asn Glu Xaa Asp Ile Val Gly Asn Ile Gln Ala  
 130 135 140  
 Thr Ser Xaa Cys Leu His Pro Thr Asp Leu Gln Lys Val Ala Glu Met  
 145 150 155 160  
 Ile Arg Glu Glu Gly Tyr Asp Ser Xaa Phe Ser Val Val Arg Arg His  
 165 170 175  
 Gln Phe Arg Trp Ser Glu Ile Gln Lys Gly Val Arg Glu Val Thr Glu  
 180 185 190  
 Pro Leu Asn Leu Asn Pro Ala Lys Arg Pro Arg Arg Gln Asp Trp Asp  
 195 200 205  
 Gly Glu Leu Tyr Glu Asn Gly Ser Phe Tyr Phe Ala Lys Arg His Leu  
 210 215 220  
 Ile Glu Met Gly Tyr Leu Gln Gly Gly Lys Trp His Thr Thr Lys Cys  
 225 230 235 240  
 Glu Leu Glu His Ser Val Asp Ile Asp Val Asp Ile Asp Trp Pro Ile  
 245 250 255  
 Ala Glu Gln Arg Val Leu Arg Tyr Gly Tyr Phe Gly Lys Glu Lys Leu  
 260 265 270  
 Lys Glu Ile Lys Leu Leu Val Cys Asn Ile Asp Gly Cys Leu Thr Asn

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Leu	Lys	Leu	Asp	Cys	Lys	Met	Glu	Val	Ser	Val	Ser	Asp	Lys	Leu	Ala				
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Val	Val	Asp	Glu	Trp	Arg	Lys	Glu	Met	Gly	Leu	Cys	Trp	Lys	Glu	Val				
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Ala	Tyr	Leu	Gly	Asn	Glu	Val	Ser	Asp	Glu	Glu	Cys	Leu	Lys	Arg	Val				
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Gln	Lys																		

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	65				70					75					80					
tac	ggg	gag	cac	aaa	cga	cat	ctg	gag	ttc	agc	cat	gac	cag	tac	agg				288	
Tyr	Gly	Glu	His	Lys	Arg	His	Leu	Glu	Phe	Ser	His	Asp	Gln	Tyr	Arg					
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gag	ctg	cag	agg	tac	gcc	gag	gag	gtt	ggg	atc	ttc	ttc	act	gcc	tct				336	
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aag aca gcc aaa aaa ggt cgc cca atg gtg atc tcc agt ggg atg cag	480
Lys Thr Ala Lys Lys Gly Arg Pro Met Val Ile Ser Ser Gly Met Gln	
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tca atg gac acc atg aag caa gtt tat cag atc gtg aag ccc ctc aac	528
Ser Met Asp Thr Met Lys Gln Val Tyr Gln Ile Val Lys Pro Leu Asn	
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225 230 235 240	
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Leu Asp Lys Thr Trp Lys Gly Ser Asp His Ser Ala Ser Leu Glu Pro	
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Gly Glu Leu Ala Glu Leu Val Arg Ser Val Arg Leu Val Glu Arg Ala	
260 265 270	
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Leu Gly Ser Pro Thr Lys Gln Leu Leu Pro Cys Glu Met Ala Cys Asn	
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Glu Lys Leu Gly Lys Ser Val Val Ala Lys Val Lys Ile Pro Glu Gly	
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acc att cta aca atg gac atg ctc acc gtg aag gtg ggt gag ccc aaa	960
Thr Ile Leu Thr Met Asp Met Leu Thr Val Lys Val Gly Glu Pro Lys	
305 310 315 320	
gcc tat cct cct gaa gac atc ttt aat cta gtg ggc aag aag gtc ctg	1008
Ala Tyr Pro Pro Glu Asp Ile Phe Asn Leu Val Gly Lys Lys Val Leu	
325 330 335	
gtc act gtt gaa gag gat gac acc atc atg gaa gaa ttg gta gat aat	1056
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Leu Asp Val Ala Lys Arg Met Ile Arg Met Ala Lys Glu Cys Gly Ala  
35 40 45  
Asp Cys Ala Lys Phe Gln Lys Ser Glu Leu Glu Phe Lys Phe Asn Arg  
50 55 60  
Lys Ala Leu Glu Arg Pro Tyr Thr Ser Lys His Ser Trp Gly Lys Thr  
65 70 75 80  
Tyr Gly Glu His Lys Arg His Leu Glu Phe Ser His Asp Gln Tyr Arg  
85 90 95  
Glu Leu Gln Arg Tyr Ala Glu Glu Val Gly Ile Phe Phe Thr Ala Ser  
100 105 110  
Gly Met Asp Glu Met Ala Val Glu Phe Leu His Glu Leu Asn Val Pro  
115 120 125  
Phe Phe Lys Val Gly Ser Gly Asp Thr Asn Asn Phe Pro Tyr Leu Glu  
130 135 140  
Lys Thr Ala Lys Lys Gly Arg Pro Met Val Ile Ser Ser Gly Met Gln  
145 150 155 160  
Ser Met Asp Thr Met Lys Gln Val Tyr Gln Ile Val Lys Pro Leu Asn  
165 170 175  
Pro Asn Phe Cys Phe Leu Gln Cys Thr Ser Ala Tyr Pro Leu Gln Pro  
180 185 190  
Glu Asp Val Asn Leu Arg Val Ile Ser Glu Tyr Gln Lys Leu Phe Pro  
195 200 205  
Asp Ile Pro Ile Gly Tyr Ser Gly His Glu Thr Gly Ile Ala Ile Ser  
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Val Ala Ala Val Ala Leu Gly Ala Lys Val Leu Glu Arg His Ile Thr  
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Glu Lys Leu Gly Lys Ser Val Val Ala Lys Val Lys Ile Pro Glu Gly  
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 Tyr Leu His Leu Met Glu Tyr Ala Val Ser Leu Asn Leu Asp Val Phe  
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 Ser Thr Pro Phe Asp Glu Asp Ser Ile Asp Phe Leu Ala Ser Leu Lys  
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 145 150 155 160  
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 Phe Ile Asn Asn Lys Val Pro Val Gly Asn Ile Thr Ile Leu His Cys  
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Gln Lys Ile Trp Lys Ile Pro Ser Gly Glu Leu Leu Asn Leu Pro Tyr	
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